1. Differentiate the following function: $f(x) = -x^{14}$

2. Differentiate the following function: $f(x) = \dfrac{-4}{\sqrt[3]{x^2}}$

3. Differentiate the following function: $f(x) = 3x^3$

4. Differentiate the following function: $f(x) = \dfrac{4}{\sqrt[2]{x^{11}}}$

5. Differentiate the following function: $f(x) = 3x^8$

6. Differentiate the following function: $f(x) = \dfrac{1}{x^{11}}$

7. Differentiate the following function: $f(x) = 3x^5$

8. Differentiate the following function: $f(x) = -2x^6$

9. Differentiate the following function: $f(x) = -x^3$

10. Differentiate the following function: $f(x) = -4x^{15}$

Answers: 1. $-14x^{13}$ 2. $\dfrac{8}{3\sqrt[3]{x^5}}$ 3. $9x^2$ 4. $\dfrac{-22}{\sqrt[2]{x^{13}}}$ 5. $24x^7$ 6. $\dfrac{-11}{x^{12}}$ 7. $15x^4$ 8. $-12x^5$ 9. $-3x^2$ 10. $-60x^{14}$

Solutions:

1. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} - x^{14}$ ▶ Write the function as a power:

$= \dfrac{\mathrm{d}}{\mathrm{d}x} - x^{14}$ ▶ Use the constant factor rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\dfrac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= (-1)\dfrac{\mathrm{d}}{\mathrm{d}x} x^{14}$ ▶ Use the power rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} x^n = nx^{n-1}$

$= (-1)(14)x^{14-1}$ ▶ Simplify:

$= -14x^{13}$ ▶ Write the result in a standard form:

$= -14x^{13}$

2. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} \dfrac{-4}{\sqrt[3]{x^2}}$ ▶ Write the function as a power:

$= \dfrac{\mathrm{d}}{\mathrm{d}x} - 4x^{\frac{-2}{3}}$ ▶ Use the constant factor rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\dfrac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= (-4)\dfrac{\mathrm{d}}{\mathrm{d}x} x^{\frac{-2}{3}}$ ▶ Use the power rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} x^n = nx^{n-1}$

$= (-4)\dfrac{-2}{3} x^{\frac{-2}{3}-1}$ ▶ Simplify:

$= \dfrac{8}{3} x^{\frac{-5}{3}}$ ▶ Write the result in a standard form:

$= \dfrac{8}{3\sqrt[3]{x^5}}$

3. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} 3x^3$ ▶ Write the function as a power:

$= \dfrac{\mathrm{d}}{\mathrm{d}x} 3x^3$ ▶ Use the constant factor rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\dfrac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= (3)\dfrac{\mathrm{d}}{\mathrm{d}x} x^3$ ▶ Use the power rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} x^n = nx^{n-1}$

$= (3)(3)x^{3-1}$ ▶ Simplify:

$= 9x^2$ ▶ Write the result in a standard form:

$= 9x^2$

4. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} \dfrac{4}{\sqrt[2]{x^{11}}}$ ▶ Write the function as a power:

$= \dfrac{\mathrm{d}}{\mathrm{d}x} 4x^{\frac{-11}{2}}$ ▶ Use the constant factor rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\dfrac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= (4)\dfrac{\mathrm{d}}{\mathrm{d}x} x^{\frac{-11}{2}}$ ▶ Use the power rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} x^n = nx^{n-1}$

$= (4)\dfrac{-11}{2} x^{\frac{-11}{2}-1}$ ▶ Simplify:

$= \dfrac{-22}{1} x^{\frac{-13}{2}}$ ▶ Write the result in a standard form:

$= \dfrac{-22}{\sqrt[2]{x^{13}}}$

5. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} 3x^8$ ▶ Write the function as a power:

$= \dfrac{d}{dx} 3x^8$ ▶ Use the constant factor rule: $\dfrac{d}{dx} cf(x) = c \dfrac{d}{dx} f(x)$

$= (3) \dfrac{d}{dx} x^8$ ▶ Use the power rule: $\dfrac{d}{dx} x^n = nx^{n-1}$

$= (3)(8)x^{8-1}$ ▶ Simplify:

$= 24x^7$ ▶ Write the result in a standard form:

$= 24x^7$

6. $f'(x) = \dfrac{d}{dx} f(x) = \dfrac{d}{dx} \dfrac{1}{x^{11}}$ ▶ Write the function as a power:

$= \dfrac{d}{dx} x^{-11}$ ▶ Use the constant factor rule: $\dfrac{d}{dx} cf(x) = c \dfrac{d}{dx} f(x)$

$= (1) \dfrac{d}{dx} x^{-11}$ ▶ Use the power rule: $\dfrac{d}{dx} x^n = nx^{n-1}$

$= (1)(-11)x^{-11-1}$ ▶ Simplify:

$= -11x^{-12}$ ▶ Write the result in a standard form:

$= \dfrac{-11}{x^{12}}$

7. $f'(x) = \dfrac{d}{dx} f(x) = \dfrac{d}{dx} 3x^5$ ▶ Write the function as a power:

$= \dfrac{d}{dx} 3x^5$ ▶ Use the constant factor rule: $\dfrac{d}{dx} cf(x) = c \dfrac{d}{dx} f(x)$

$= (3) \dfrac{d}{dx} x^5$ ▶ Use the power rule: $\dfrac{d}{dx} x^n = nx^{n-1}$

$= (3)(5)x^{5-1}$ ▶ Simplify:

$= 15x^4$ ▶ Write the result in a standard form:

$= 15x^4$

8. $f'(x) = \dfrac{d}{dx} f(x) = \dfrac{d}{dx} - 2x^6$ ▶ Write the function as a power:

$= \dfrac{d}{dx} - 2x^6$ ▶ Use the constant factor rule: $\dfrac{d}{dx} cf(x) = c \dfrac{d}{dx} f(x)$

$= (-2) \dfrac{d}{dx} x^6$ ▶ Use the power rule: $\dfrac{d}{dx} x^n = nx^{n-1}$

$= (-2)(6)x^{6-1}$ ▶ Simplify:

$= -12x^5$ ▶ Write the result in a standard form:

$= -12x^5$

9. $f'(x) = \dfrac{d}{dx} f(x) = \dfrac{d}{dx} - x^3$ ▶ Write the function as a power:

$= \dfrac{d}{dx} - x^3$ ▶ Use the constant factor rule: $\dfrac{d}{dx} cf(x) = c \dfrac{d}{dx} f(x)$

$= (-1) \dfrac{d}{dx} x^3$ ▶ Use the power rule: $\dfrac{d}{dx} x^n = nx^{n-1}$

$= (-1)(3)x^{3-1}$ ▶ Simplify:

$= -3x^2$ ▶ Write the result in a standard form:

$= -3x^2$

10. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} f(x) = \dfrac{\mathrm{d}}{\mathrm{d}x} - 4x^{15}$ ▶ Write the function as a power:

$= \dfrac{\mathrm{d}}{\mathrm{d}x} - 4x^{15}$ ▶ Use the constant factor rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} cf(x) = c\dfrac{\mathrm{d}}{\mathrm{d}x} f(x)$

$= (-4)\dfrac{\mathrm{d}}{\mathrm{d}x} x^{15}$ ▶ Use the power rule: $\dfrac{\mathrm{d}}{\mathrm{d}x} x^n = nx^{n-1}$

$= (-4)(15)x^{15-1}$ ▶ Simplify:

$= -60x^{14}$ ▶ Write the result in a standard form:

$= -60x^{14}$